with the variations of the mariner's compass, and are evidently primarily due to the same cause. It is when the aurora is present that they acquire extraordinary energy, and change their direction and intensity with great rapidity. Their effects are then observable simultaneously over the whole globe. They interfere seriously with the transmission of telegraph messages.

They have been studied and examined with great care in England. The eminent engineer, Mr. W. H. Barlow, F.R.S., was the first in the field, and his paper before the Royal Society in 1846 has scarcely been improved upon or added to. The late C. V. Walker was an incessant observer, and sent several papers to the Royal Society. Varley added considerably to our knowledge, and there are several papers by Mr. Preece, F.R.S., on their behaviour. The latter remarked that in the great storm of January 31, 1881, the currents acquired an electromotive force of ·3 volt per kilometre of earth surface and an intensity of 30 milliamperes—currents far stronger than those used for telegraphy. The *Proceedings of the Society of Telegraph Engineers* contain several interesting communications from Adams, Dresing, O. Walker, W. Ellis, Saunders, and others. It was warmly discussed at the Congress of 1881, which decided (1) that certain short lines in each country, independent of its general telegraph system, should be exclusively devoted to their study; (2) that long lines, particularly those underground, should be utilised as frequently as possible for the same purpose,—lines N. and S. and E. and W. being taken by preference, and one day per week—Sunday—being simultaneously employed for the purpose.

It was also suggested that during the year 1883 the 1st and 15th of each month should be taken for separate and careful observation. These resolutions have been faithfully carried out in Paris, and M. Blavier's work is the consequence. They have also been followed with great advantage in Germany and in Russia.

Permanent wires at right angles to each other have for many years been fixed and used in Greenwich, but the observations have not been systematically published, though the records are photographically printed.

M. Blavier has, since September 1883, organised a very careful system of automatic observation, by employing a clockwork apparatus similar to that designed by M. Mascart to register simultaneously the three components of terrestrial magnetism. He uses the dead-beat galvanometer of Deprez and d'Arsonval, shunted so as to meet the cases of all currents. As the chief point to be determined is the difference of potentials at the ends of a circuit, M. Blavier made the resistance of each long circuit examined equal to $10,000^{\omega}$, and each short circuit 1000^{ω}. The ordinates of the curve traced give indirectly the electromotive forces present. His excellent memoir contains a series of these curves, and very instructive they are. A complete lunar month from February 28 to March 28 is given. Observations were taken on aërial and underground wires. The general direction of maximum electromotive force in France is N.W.—S.E., making an angle of 56° with the magnetic meridian. M. Blavier concludes from the deflections of the needles that the disturbances of the magnetic elements are due to accidental electric currents circulating in the higher regions of the atmosphere although the earth currents circulate in the crust of the globe. He favours De la Rive's theory of the aurora borealis as being due to the circulation of electric currents in the higher regions of the atmosphere, in support of which he mentions several atmospheric effects well recorded as simultaneous with earth currents, such as intense scintillation of the stars observed by Montigny, and tempests. He associates earth currents with trade winds, and thereby indirectly with the sun.

Altogether M. Blavier's *brochure* is very ably written and a credit to the department of which he is such an old and distinguished member.

NOTES

THE French Minister of Education and the Fine Arts has proposed to place at the disposal of M. Pasteur, for the prosecution of his scientific experiments, a large domain situated at Villeneuve-Etang, which belongs to the State.

COLONEL DONNELLY has been appointed Secretary and permanent head of the Science and Art Department of the Privy Council.

THE Paris Academy of Sciences has nominated M. Cailletet, the inventor of the apparatus for the liquefaction of gas, a *Membre libre* in place of the late M. du Moncel. The Academy has appointed a Commission of six members to prepare a list of candidates for the office of Perpetual Secretary.

THE death is announced of M. Bontemps, the author of several volumes on pneumatic telegraphy, and engineer to the French Government for the construction of the Paris system.

A COMMITTEE has been formed at Alais (Gard) for erecting a statue in that city to M. Dumas. A committee will also be established for the erection of a statue to M. Wurtz in Paris.

THE election of Dr. C. S. Roy to the new Professorship of Pathology at Cambridge augurs well for the scientific development of the rapidly-increasing medical school of that University. Dr. Roy's work, both as George Henry Lewes Scholar and as Professor-Superintendent of the Brown Institution, has, it is well known, been of the highest merit and promise.

THE *conversazione* of the Institution of Civil Engineers takes place to-night at the South Kensington Museum.

WE are pleased to learn from a correspondent that the Natural History Department of the University of Edinburgh has undergone remarkable development during the last six months. Two years ago it had no lecture-room, and only one small room serving both as museum and laboratory. Now the old chemistry class-room, in which graduations and other ceremonials used to be held, and which is still the largest class-room in the University, has been handed over to the Professor of Natural History. There has not been time to have the class-room reseated, but the comfort of lecturer and students has been cared for in a still more important way, viz. by the erection of a ventilating fan, which changes the air several times every hour. The great demand for practical teaching which marked Prof. Ewart's advent to Edinburgh could only then be met with by resorting to a remote corner of the College buildings. Now the practical work is carried on in a splendid, beautifully decorated, well-lighted hall—a dingy museum in Jameson's time, but now capable of accommodating about 130 men at a time. In addition to this laboratory there is an adjacent smaller work-room for advanced students. A series of tanks is in process of erection in the lower room, which corresponds in size to the large laboratory, and which it is intended to convert into a laboratory provided with all the necessary apparatus for studying the life-history and development of marine organisms. When the other rooms which formerly belonged to the Natural History Department are added, the arrangements for teaching zoology in Edinburgh will be alike complete and satisfactory.

WE understand that the University of St. Andrew is about to approach the Government with the view of obtaining funds for extending the Natural History Museum and at the same time for providing a marine laboratory within the walls of the University, while the more practical work of hatching, &c., which the Fishery Board for Scotland is carrying on will be provided for by a laboratory on the cliff immediately behind the College. It is proposed to prosecute the more purely scientific work within the walls of the College itself. The College is so near the proposed hatchery that the same pumping apparatus will serve for both laboratories, and thus, when established, the working expenses will be comparatively trifling. If the University and the Fishery Board succeed in carrying out their plans, biology will receive a mighty impulse at St. Andrew's, and the famous bay once more be peopled with an abundant supply of fish.

THE Clothworkers' Company have voted 2000*l*. towards the fund of 20,000*l*. required for the complete equipment of the new Central Institution of the City and Guilds of London Institute, this being additional to their original building grant of 10,000*l*. and their annual subscription of 3000*l*.

WE learn that orders have been given by the Inspector-General of the Imperial Maritime Customs of China, that meteorological observations made in the Treaty Ports and in the lighthouses are in future to be sent to the Government Astronomer at the Hong Kong Observatory, but that it is not at present the intention of the Chinese Government to start a meteorological service in China. With regard to observatories great progress has been made of late years. Central Government observatories exist in Japan, Peking (Russian), Hong Kong (British), and Batavia (Dutch), while the different Australian colonies which are covered with a network of minor meteorological stations, possess numerous central observatories, and it is very likely that this row of observatories will be extended further south, as steps are being taken to found an observatory in New Zealand, while the Russian Government is likely to extend its stations to the north of Vladivostock. First-class observatories are also supported by the Jesuit Order in Corea, China, and Manila, as well as elsewhere. For the investigation of typhoons, the terrible scourges of the China Sea, Father Faura, at Manila, has done most important work, and the utility of his observatory cannot but be extended when the Chinese Customs start self-recording meteorological instruments at South Cape, Formosa. But while each observatory is individually engaged in studying the peculiar features of its local climate in all its vicissitudes, it is by a comparison of the results exhibited in the different annual volumes published by each of them that we gain an insight into the laws that govern the general motions of the atmosphere and which underlie the peculiar features of each local climate. Thus in the China Sea the typhoons originate from local causes (heat and moisture), but the form and direction of their tracks are determined by the general laws of atmospheric motion in these regions.

THE first Circular of Information issued this year by the United States Bureau of Education relates to the approaching International Prison Congress at Rome in October next. The Bureau considers that the work of education is by no means limited to good children; and certainly, if no other power takes the reformation of the vicious in hand, their reform does become by so much the most important part of the work overlooked by this office, as they that are sick more need the physician than they that are whole. Prison Congresses were held in Europe in 1845, 1846, and 1857, and after an interval were revived through a paper by Count Sollohub of Russia, published in the Report of the New York Prison Association in 1868. His suggestions were adopted by Dr. E. C. Wines, the Secretary of that Society, and a Prison Congress was brought together at Cincinnati in 1870. Dr. Wines was elected Commissioner to act at an International Congress, and he brought about such meetings, first in London, then in Stockholm, and now at Rome. The questions for consideration are:—(1) As to the advantages from a reformatory view of imprisonment, and whether more useful and less degrading labour, without forcible detention, or even simple admonitions, might not be less mischievous and more effectual; as to length of sentence; as to finding the instigators to crime; and the treatment of juveniles. (2) Upon prison architecture, the keeping of new away from old offenders, Prison Commissions, prison hygiene, dietary and education, the rivalry between prison and free labour, and the remuneration of the former, and the use to be made of Sundays and holidays in the interest of education. (3) International arrangements, repression of vagrancy, and the desirability of societies for the help of discharged convicts.

ANOTHER of the Bureau's publications is a Report of the School of Classical Studies at Athens; and although this hardly falls under the head of Nature studies, yet a journal of science may note with satisfaction the spread of a scientific spirit which feels how far clearer is the knowledge of history after imbibing such object lessons as must be gained from an acquaintance with the climate and aspect of the country, and their natural influence upon the race inhabiting it, from the scene of the philippic, the fight, or the festival.

"To expedite school business and diminish future controversies" the United States Bureau of Education has published a digest of 700 law decisions, which have been made since Col. Eaton has been in office, upon all the details of education in that country. The number of States, each independent of all the rest, has added greatly to the labour of such a digest, and its recommendation that, while variety of systems should be encouraged in different States, uniformity of system should be enforced in each State seems to combine the greatest amount of practical advantage.

THE following alterations have been made in the arrangements for the Friday evening meetings at the Royal Institution:—Mr. Willoughby Smith will give the discourse on June 6, on Experiments in connection with Volta-Electric and Magneto-Electric Induction; and on June 13 (extra evening), Prof. Dewar will give a discourse on Researches on Liquefied Gases.

MESSRS. CHAS. GRIFFIN AND CO. announce the publication of a "Year-Book of the Scientific and Learned Societies of Great Britain and Ireland." It will give some account of the constitution and working of more than 600 societies, distributed under the following heads:—(1) Science generally; (2) Mathematics and Physics; (3) Chemistry and Photography; (4) Geology and Mineralogy; (5) Biology, including Microscopy and Anthropology; (6) Economic Science and Statistics; (7) Mechanical Science and Architecture; (8) Naval and Military Science; (9) Agriculture and Horticulture; (10) Law; (11) Medicine; (12) Literature; (13) Psychology; (14) Archæology. There will also be an appendix giving a list of the chief scientific societies throughout the world.

MESSRS. W. SWAN SONNENSCHEIN AND CO. request us to announce that the whole edition of Profs. Nägeli and Schwendener's work on the Microscope, which has been in the press for so long a time, and which would have been ready for publication in a few days, was destroyed in the recent disastrous fire in Paternoster Row. A new edition has been at once sent to press, and it is hoped that the work will be in the hands of the public very shortly, since the English editors of the book had already completed their revision of the proof-sheets.

PROF. A. E. VERRILL, *Science* states, has in the press a very important paper, entitled "Second Catalogue of Mollusca recently added to the Fauna of the New England Coast and adjacent parts of the Atlantic, consisting mainly of Deep-Sea Species, with Notes on others previously reported." These are chiefly derived from the dredgings of the Fish Commission, are well illustrated, and worked up in the full and careful manner characteristic of the author. It appears in the *Transactions of the Connecticut Academy of Sciences*, and is illustrated by Emerton.

THE additions to the Zoological Society's Gardens during the past week include a Bonnet Monkey (*Macacus sinicus* ♂) from India, presented by Mr. J. L. Ellis; a Black-backed Jackal (*Canis mesomelas*) from South Africa, presented by Mr. H. P. Plummer; a Spotted Eagle Owl (*Bubo maculosus*) from Africa, presented by Capt. Larner; a Nicobar Pigeon (*Calœnas nicobarica*) from the Indian Archipelago, presented by Mr. Thomas H. Haynes; a Herring Gull (*Larus argentatus*), European, presented by Dr. E. H. Cree; a Bonnet Monkey (*Macacus sinicus* ♂) from India, deposited; a Rabbit-eared Perameles (*Perameles lagotis*) from West Australia, two Specious Pigeons (*Columba speciosa*) from South America, purchased; a Bennett's Wallaby (*Halmaturus bennetti* ♂) from Tasmania, received in exchange; a Wapiti Deer (*Cervus canadensis* ♂) born in the Gardens.

GEOGRAPHICAL NOTES

IN *Petermann's Geographische Mittheilungen*, 1884, Heft iv., is an article on the island of São Thomé, accompanied by maps both of that island and of the neighbouring island of Rolas, by Prof. R. Greeff in Marburg. The contribution is the result of several months' residence on those islands in the course of a scientific tour through the islands of the Gulf of Guinea in 1879 and 1880. The map of the two islands in question is the united product of Prof. Greeff and of the proprietor of Rolas, Francisco José de Araujo: a map based partly on immediate exploration and observation, partly on careful information derived from natives. It both corrects and supplements in considerable measure the only two previous maps of St. Thomas known to the authors—that of 1829 by the English commander, T. Boteler, and that of 1844 by the Portuguese, Lopez de Lima. In the present map are entered for the first time the districts into which St. Thomas is divided, its "villas," its connecting highways, its more important plantations, and also the demarcation between the comparatively small cultivated part and the large wooded wilderness of the south and the interior. The map of Rolas is the first that has yet appeared of this island, which is intersected by the Equator. The history of St. Thomas is sketched from the year 1470, when it was discovered, without a single human inhabitant and almost wholly overgrown with forest, by the Portuguese sailors, João de Santarem and Pero de Escobar. Prof. Greeff calculates the dimensions of the island, which stretches ovally from 0° 2′ to 0° 30′ N. lat. and from 6° 34′ to 6° 54′ E. long., at about 52 kilometres by 34 kilometres, or altogether about 920 square kilometres.

WRITING from Bakundu-ba-Nambeleh in October 1883, St. von Rogozinski gives an account of his travels between Cameroon and Calabar. On August 13 he left the coast in company with Clemens Tomczek, made his way up the Mungo for Bakundu, his other fellow-travellers being bound for the station of Mondoleh. On September 11 they determined on traversing the region of the Upper Mungo as far as its falls. Making their way through thick forest and over mountain chains, they came on Eliki, where were three rapids, and from which point the Mungo is no longer navigable. The land to the north-east gets even more elevated, and the path of the travellers became continually crossed by streams. At length, at 4° 46′ 15″ N. lat. and 9° 33′ 30″ E. long., they looked down from a hill on the sources of the Yabiang or Abo, a deep and "indescribably beautiful" valley clothed in the most exuberant tropical vegetation. The principal town here is Balombi-ba-Kange, built like all towns of that quarter in the form of a crescent or arch, with fetish houses in the middle. On September 14 they left Kange, and passed the slave town of Bakú. Further to the north they entered, the same day, the large town of Mokonje, the centre of the ivory trade for the lands of Biafra Bay. Next passing Bao, they reached Mambanda, close to the falls and the new lake, Balombi-ba-Mbu, they were in quest of, on the 16th. Quite exhausted, and finding their way further to the north rendered impossible by troops of elephants and the want of any guide that would venture, they were reluctantly obliged to fall back on the mission station of Bakundu, where Rogozinski was compelled to stay and nurse the wounds on his feet and ankles. On the 23rd Tomczek resumed alone the march northwards by a different route, and happily reached the lake M'Bu at half a day's march from Boa. The beautiful lake is four miles long, of round shape, inclosed by thickly-wooded hills, is deep, abounds in fishes, and receives on the west the river Soho, six or seven metres broad. Apparently it is of volcanic origin.

IN a series of papers upon Early Discoveries in Australasia which Mr. E. A. Petherick, F.R.G.S., is contributing to the *Melbourne Review*, some curious and interesting facts are now made known for the first time, namely, the discovery of the west coast of Australia by the survivors of Magellan's expedition in 1522, the passage of Torres Straits by another Spanish vessel in 1545, sixty years before Torres, whose discovery and that of a Dutch vessel, the *Duyphen*, in the same year (1606) are hitherto the earliest authenticated accounts of the sighting of any part of the Australian coast by European vessels. But the most noteworthy statement Mr. Petherick makes is that the name of New Guinea belongs to that part of Australia now known as Queensland, and that the great island of Papua has borne the name of New Guinea erroneously for more than three centuries. Mr. Petherick is also able, from evidence upon a French *mappemonde* dated 1566, now in the Bibliothèque Nationale, Paris, to refute all claims to the discovery of Australia made at various times during the present and the last century on behalf of French navigators. Notwithstanding the early Spanish discoveries of Australia now referred to, Mr. Petherick asserts that the Portuguese were in the eastern seas twenty years earlier, and probably discovered Australia in the first decade of the sixteenth century.

LAST autumn the expedition under Lieut. Holm for exploring the east coast of Greenland, and which is again to start northwards this spring, met a party of about sixty East-Greenlanders —men, women, and children—south of the island of Aluk, on the east coast. They were on the way to the west coast to sell bear-, fox-, and seal-skins. Every attempt was made by the Danish explorer to induce some of them to return and act as guides on his journey northwards, but the prospect of a visit to a Danish settlement proved too great. A considerable number of East-Greenlanders die on their way to the west coast. The East-Greenlanders are reported to differ much from the West-Greenlanders in stature and appearance, the men being often tall, with black beards and European cast of face. This seems to be particularly the case with those living far north. Both East- and West-Greenlanders have small hands and feet. During the year 1883 four boats with heathen East-Greenlanders arrived at Julianshaab. Three of these came from the distant Angmasalik, and in them there were also, for the first time, natives from Kelalualik, which is five days' journey further north. The latter stated that in the winter they were in the habit, when journeying on sleighs, of meeting with people living much further north. Kelalualik being situated, it is believed, between lat. 67° and 68° N., it may be assumed that the whole line of coast from lat. 65° to 70° is to some degree populated.

FROM the annual report of the Russian Geographical Society for 1883 we learn that the meteorological observations of the Novaya Zemlya Station are expected to be published in full in the course of this year, while the observers of the Sagastyr Meteorological Station, on the Lena, have remained there for a year longer. The publications of the Society, besides the *Izvestia* have been the following:—Prjevalsky's third journey to Central Asia, Potanin's sketches of North-Western Mongolia, Karelin's travels on the Caspian, and Maynoff's anthropology of the Morovinians. The next publications will contain: the report of Unkovsky's embassy to Kontaisha under Peter I., M. Sadovnikoff's folklore of Samara, the third volume of M. Potanin's work on Mongolia, a geological map of the shores of Lake Baikal, by M. Chersky, the remarkable collection of maps of the delta of the Amu-daria, by M. Kaulbars, and the concluding fascicule of the capital work of M. Semenoff, the "Geographical and Statistical Dictionary of Russia." The great gold medal has been awarded to M. Severtsoff for his explorations in Turkestan, and Count Lütke's medal to Prof. Wild for his labours in Russsian meteorology, and for his work, "On the Temperature of the Air in Russia." The smaller gold medals were awarded to M. Lessar for his journeys, MM. Agapitoff and Khangaloff for their work on Shamanism in Siberia, M. Adrianoff for his journey to the Altay and Kuzuetzky Alatau, and M. Usoff, member of the West Siberian branch of the Society. Silver medals were awarded to Lieut. F. Schwatka and Mr. W. Hoffman, Secretary to the Anthropological Society of Washington; to MM. Andréeff, Grinevetsky, Konshin, Kosyakoff, Krivosheya, Kudryavtseff, Prince Urusbieff, Fuss, Wereschaghin, and Dobrotvorsky. The library has been increased by 4001 volumes.